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ABSTRACT

This study presents work in progress that investigates the use of visual learning logs by preservice elementary teachers as one component of developing visual literacy for science teaching and learning. The purpose of the study is to explore the use of visual learning logs as an alternative mode for thinking and communicating about experiences in an elementary science methods course that emphasizes developmentally appropriate, constructivist teaching. Visual learning logs consist of free-form drawings (pictograms) produced by the preservice elementary teachers in the study in conjunction with weekly written journal assignments. Findings suggest that the visual learning logs provide an alternative way to help preservice elementary teachers gain confidence in their science teaching ability and to prepare them in use with unfamiliar constructivist pedagogies. (PVD)

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# Exploring the Use of Visual Learning Logs in an Elementary Science Methods Class

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ED 403 161

Visual data such as photographs, drawings, and schematics play a vital role in the scientific enterprise. In the everyday world icons, symbols, and signs are pervasive and powerful forms of visual communication. As children learn to read and write they do so with the aid of pictures and photographs. In science teaching, learners interact with nontextual pictorial elements of instructional materials and are also often asked to sketch or draw their work.

The literature research on visual literacy is related to curriculum and instruction (Braden, 1987), to visual-verbal symbiosis (Braden, 1993), to teaching visual literacy at the elementary, high school and college levels (Case-Grant, 1973; Beauchamp, 1991); to foreign language instruction (Morain, 1976); to international communication of ideas without words (Sondak & Sondak, 1991); and to interpretation of environmental signs (Horsley, 1988). No research was found on the role of visual literacy as a component of science literacy or of science teacher preparation.

The notion of creating visual representations is supported by Paivio's (1990) dual coding theory. Specifically, Paivio (1990) proposes that there are separate visual and verbal stores in memory and that learning is more effective when dual coding takes place. The use of visual learning logs as we have done in this preliminary study also incorporates the advantages of techniques like concept mapping, in conjunction with reflective journal entries.

In this study we present work in progress that investigates the use of visual learning logs by preservice elementary teachers as one component of developing visual literacy for science teaching and learning. Visual learning logs (VLL) consist of free-form drawings (i.e., pictograms) produced by the preservice elementary teachers in the study in conjunction with weekly written journal assignments. The intent of VLL was not to illustrate the written journals, but rather to serve as an alternative to textual descriptions, explanations, interpretations and reflections on the course learning experiences.

**Purpose**

The purpose of the study is to explore the use of visual learning logs (VLL) as an alternative mode for thinking and communicating about experiences in an elementary

SE 059 673



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science methods course that emphasizes developmentally appropriate, constructivist teaching. The ultimate aim of VLL is to improve science instruction for young children, including prereaders, early readers and nonnative English speakers. Specific questions investigated are

1. What kinds of information can be conveyed using VLL?

2. What kinds of ideas can be expressed better in VLL than in written journals?

**Methodology**

Subjects were 20 preservice teachers enrolled in an elementary science methods class at a university in Hawaii. Two were males. The class was culturally diverse, representing the four major ethnic groups in Hawaii: Caucasians, Japanese and Filipino Americans, and Hawaiian and Pacific Islanders, plus other ethnic groups. For this preliminary study, results are aggregated.

**Procedure**

The preservice elementary science teachers were instructed to submit a visual learning log in conjunction with a written journal entry each week throughout a semester. Their specific instructions were to "draw a pictogram (a visual learning log) showing what you learned and what it means to you. Include feedback on your feelings about your learning experience." They were told to regard their VLL as an alternative form of a journal. That is, their visual logs should convey their ideas visually and not be dependent on information in their written journals.

The preservice teachers were free to develop their own nontextual representational forms to depict and interpret their learning experiences. For affective representations, the class discussed the possible use of visual affective symbols such as a smiling face or other facial expressions, or stylized affective ratings such as thumbs-up or thumbs-down symbols. To connect the learning activities with time and place in memory, students were encouraged to visually link their classroom experience with something noteworthy about each day.

Preliminary work reported in this session examines VLL collected over a sampled two-week period, plus end-of-semester written comments from the students on the usefulness of VLL. To determine the kinds of information preservice teachers considered important in their visual representations of the science methods class, a categorization system was devised by the authors to carry out content analyses of the VLL. The categories are listed under Data Analysis and Findings.

Students were asked at the end of the semester to look back over both drawn VLL and written textual journals and respond to "What kinds of ideas can you better express using a pictogram, not a written journal?" Responses were analzyed using a modification of the coding system used for VLL content analysis, then summarized.

**Data Analysis and Findings**

Data analyses consisted of calculating frequencies for each of the content analysis categories. Results indicated that the majority of VLL images consisted of depictions of science activities carried out in class (22%), group learning activities (22%), affect (13%),and science education concepts (11%). Images in other categories with lower percentages included descriptions of events in the daily environment (10%), nature of science (8%), activities chosen by groups (5%), general education concepts (5%), and science teaching resources (3%). Uncodeable responses were less than 1%.

These coded VLL findings indicate that preservice teachers are experiencing and remembering science teaching in their methods class as active learning. Additionally, science is experienced as a social learning process and science content and process are connected to real world situations. These findings are consistent with course objectives.

Examination of written comments at the end of the semester revealed that students felt that compared to written journals, VLL better express

1. An immediate way for the teacher to see at a glance what the learner has experienced and selected as important. Commented a student, "When I look at the picture it reminds me and I can clearly picture the activity done in class that day."

2. Affective and aesthetic dimensions of science teaching and learning. They particularly noted that young prereaders could provide affective feedback with such images as smiling or frowning faces. One preservice elementary teacher said, "Using a pictogram, you can express aesthetic, emotional responses to activities and lessons that cannot otherwise be expressed in writing. Another said, "You can also tell what lessons were great for students because of the ratings that are used on the drawings."

3. The steps or processes involved in a hands-on activity. Visual depiction makes the process appear more realistic than using words alone. As stated by a student, "I could express my ideas using a pictogram better by drawing out the activities done."

4. Observations and details that are "hard to describe in words" including the use of realistic colors. As one student said, "You can show colors and results rather than just writing about them." Said another, "Pictograms show more detail on what something looks like."

5. An alternative means of expression for visual, nonverbal learners. As one of the male students said, "I just think overall it helps students who have trouble expressing themselves with writing. I personally enjoyed the pictograms compared to our written journals." Others mentioned "Greater opportunity for individual expression" and "Greater variety." Another said, "This also helps children who have a different learning style through color/pictures rather than just words."

6. Alternative methods for teaching and learning, including

- Engaging nonreaders, prereaders and ESL students in science learning.
- Reviewing lessons and sequences of lessons
- Evaluating and monitoring student progress, and
- Teacher's self-evaluation of lesson effectiveness.

**Working Conclusions**

Within the context of the science methods class, elementary preservice teachers are often "science shy." They have limited prior experience in science courses, and most often these courses focus on traditional teacher-centered pedagogy including lectures, note-taking, and multiple-choice tests. Findings from this study suggest that VLL provide an alternative way to help preservice elementary teachers gain confidence in their science teaching ability and to prepare them in use of unfamiliar constructivist pedagogies. Because VLL are not dependent on text, including the use of scientific or educational terminology, from the outset of the course methods students have a way of recording, reflecting, and conversing on what they learned, how it was learned, and how it was taught. VLL supported written learning logs and use of concept maps in the methods class. Findings thus far suggest that VLL

1. Create alternative ways for preservice elementary science teachers to meaningfully depict their science methods class experiences and to portray their own emerging understandings of science teaching and learning.

2. Support constructivist approaches to science teaching and draw upon multiple modalities for learning.

3. Provide a means of combining minimal verbal oral and written expression with concrete visual representations of complex ideas. Suggested here is that learners can engage with complex ideas before and during the process of mastering associated verbal learning.

4. Allow an outlet for succinct affective feedback. This is an area where young children often lack effective verbal skills. This suggests that visual learning logs may be a useful tool for young children as well as their teachers.

5. Can be used to promote reflection, for summary or review, and for evaluation.

**Further Research**

These preliminary findings point to the need for further research on the effectiveness of VLL as heuristic devices both in elementary science methods classes and with prereaders, nonreaders and ESL students. Further research is needed comparing the effectiveness of VLL and written learning logs in preservice elementary science methods classes. Research is also needed on the links between visual literacy and scientific literacy and on the learning effectiveness on learning of dual coding using visual and

verbal memory. Additional research is needed on preparing teachers for visual dimensions of science teaching and learning.

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